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THE TRADES UNION ATROCITIES IN SHEFFIELD.

The cause of labor combinations in the form of trades unions must receive a severe shock from the revelations lately made in England before a Parliamentary commission. Although the crimes were committed by individual members without the sanction of the associations—at least this may be charitably supposed—yet it will be difficult to disabuse the public mind of a prejudice against the combinations which make these crimes possible.

For years a system of tyranny has been steadily pursued by some of the workingmen's organizations toward those who refused to associate themselves with the unions. If workmen, their tools were stolen, their tenements burned or blown up with gunpowder, all sorts of tricks were played with their work, and they themselves were brutally beaten and even murdered by hired assassins. If employers, their machinery was destroyed by midnight burglars, their shops, and factories burned or blown up, their workmen intimidated, and their persons brutally maltreated. At last, the local authorities being powerless to put a stop to these outrages, either from sympathy with the perpetrators or from the terrorism which seemed to have taken the place of law, a commission was appointed by Parliament to investigate the matter, and by promising immunity from punishment to the perpetrators on confession, it has succeeded in drawing forth the details of crimes as revolting and tyranny as absolute as that of Al Hassan, the "Old Man of the Mountain." Except for these confessions of the villains, themselves, it would be impossible to believe these tales of horror.

In this case the directing and presiding Thug was one Broadhead, secretary of the Saw Grinders Union, and Treasurer of a national association of trades whose members number over 60,000. The confession of this Broadhead and two of his tools show that he paid them out of the funds of the societies whose affairs he managed, ten pounds for blowing up a house or shop and fifteen pounds for maiming or murdering an obnoxious person. After the deed was perpetrated he would offer rewards for the detection of the criminals, and denounce the atrocity in public meeting. One man named Linley was murdered by Broadhead's assasins for the sum of seven pounds ten shillings each, two being employed. Broadhead states that he committed the crimes with "great regret!" One of his victims was pounded until almost dead, another crippled for life, another killed outright. Seven houses and factories he caused to be blown up, among which was the dwelling of a butcher whose offense was that he harbored a relative who was obxoxious to Broadhead.

The effect of these revelations will probably be to destroy sympathy for the workingmen who combine in unions, and either to suppress the associations by law or by the indignation of the people. It is difficult to believe that the associations for which Broadhead acted were entirely unaware of the uses to which their money was applied, for the crime of tool stealing appears to have been very generally prevalent, and the falsification of Broadhead's accounts seem not to have instigated any investigation. He states explicitly that the secretaries of two associations gave him money for the perpetration of his crimes. How far, however, his statement about others is worthy belief is a matter on which the reader must form his own opinion.

It would be hardly fair to denounce all labor combinations because some of their members behave like fiends. There is little doubt that these crimes were the offspring of ignorance and low moral sense, rather than of association. Intellectual, and especially moral education of the members is the only safeguard of the public and preventive of organized and systematized crime.

THE EARTH BECOMING TOO SMALL FOR THE HUMAN FAMILY.

It was formerly a common practice to estimate geographical distances by the time required to travel over them. The expression, "day's journey" occurs many times in the bible and in other books translated out of the ancient tongues. This measure of distance was a very convenient one and was sufficiently exact for ordinary purposes, for it was based on many centuries of the experience of mankind in traveling. The time consumed is generally the most important incident of a journey. This word journey, by the way, originally meant only the distance traveled in a day, and it held this meaning, until modern improvements in locomotion made it indefinite. A day's journey was equivalent to a distance of twenty to thirty miles.

The facilities for travel determine the extension of commerce and civilization. Where modes of travel are easy and rapid, more people can live, and can live in greater comfort. By reason of the improvements in locomotion made during the present century, it might be shown that the earth to day is capable of supporting twice as many people as formerly.

Instead of going only 20 or 30 miles in a day over a hard and dangerous road, we glide over 300 miles by sea, and 600 by land. We travel about twenty times faster than our grandfathers; our day's journey has increased in length twenty times, and at the same time it is cheaper and safer. Because travel is more rapid, cheap, and safe, every one now is on the move. Distances are practically so lessened that it is to be feared that the earth will turn out to be a narrow stamping ground for the human family. All the nations have become neighbors. We hold world's fairs and conventions; we hope shortly to have a universal system of coinage and weights and measures, and perhaps a universal language. There is to be a metropolis of the world where all tribes of men shall be represented: will it be Paris or shall we build it in America? The tendency is to bring all to a level, but it is a level whose plane is far above any former and local civilization. There is to be a universal community of interests and thus a practical community in property.

TO THE PRESIDENT.

We respectfully call the attention of the President to the deplorable condition of the business of the Patent Office, asking that he will inquire into the mismanagement of the present Commissioner, and do something to relieve the genius of the country from the oppressive delays occasioned by official stupidity. We understand that there are between three and four thousand models of new applications now waiting examination at the Patent Offiee. The examinations in many of the most important classes of inventions are half a year, more or less, in arrears, and the interests of thousands of dependent inventors are allowed to suffer, without any steps being taken for their relief. The Patent Office was established expressly for the encouragement of inventors, but it is at present so mismanaged as greatly to discourage them.

Nothing can be more dreary or disheartening to the inventor than the delays of the Patent Office in deciding upon the novelty of the application. In many cases the entire private business of the inventor and his associates, are suspended until the decision is rendered. In other cases the delays of which we complain, occasion the ruin of the brightest prospects of the applicant.

If the President asks for an explanation from the Commissioner, the latter will make his usual stereotyped excuses and assurances,—want of room,—want of aid from the Secretary of Interior—most positive, most prolific promises of immediate, instantaneous reform. But we warn the President that unless he issues a peremptory order to have the work brought up, nothing will be done. The Commissioner seems to be incapable of doing anything of his own volition, except to make and break promises. He evidently needs a galvanic shock from his superior officer, and we hope the President will lose no time in administering the proper kind of electricity.

AIR GUNS NOT NOISELESS.

We find the following in *Harpers' Weekly* for July 13th:

Air guns have been known for more than a hundred years, yet they are rather appendages to the lecture room of the professor than for practical purposes. By the compressed air in a metallic ball, permitted to escape by the opening of a valve, ten, twenty, and possibly fifty balls may be discharged in a single minute with the deadly force of powder. The larger the volume of compressed air the greater the momentum of the bullet. A question has come up why such arms would not be of the highest importance in the time of war. Cannon might batter a fortress into powder, and ten regiments attack a fortified city with showers of balls without alarming the sentinels, because there is no report.

We regret to see a periodical like *Harpers' Weekly*, usually so accurate in its statements, aiding in the perpetuation of a popular error. It is not correct to say that the action of compressed air in an air gun has the "deadly force of powder." While air cannot be compressed by any mechanical means now used more than about forty times, giving a pressure per square inch of about six hundred pounds, the lowest estimate made of the force of exploding gunpowder is a pressure per square inch of about twenty thousand pounds. Neither is it true that the discharge of the air gun is noiseless. The shock of a suddenly liberated gas against the atmosphere is the cause of the noise of the explosion of gunpowder; it is not its combustion. So in an air gun, the liberation of the compressed air makes a report proportioned to the force of its action on the atmosphere. In the recent case of the shooting of Carr, in Brooklyn, by Skidmore, the officer who witnessed the affair testified to the sound of a dull explosion, and although the murderer was within a few feet of his victim the projectile merely entered the head, instead of passing through, as would most likely have been the case if gunpowder had been used.

It is erroneous to suppose that the air gun is noiseless. The only reason its explosion does not make so loud a report as that of gunpowder is because it has a proportionably less force.

THE NATURAL COLORS OF FIBROUS MATERIAL.

Although Nankin cotton was for many years a favorite material for thin goods, and the woven fabric was quite popular not only for its endurance but for its color, many people then and many now suppose the yellow tint of the cloth to be given by the art of the dyer. This is not so. The deep yellow, or rather the faint orange tint of the Nankin cotton is inherent in the natural product and the art of the dyer has nothing to do with it. This cotton is of the variety known to botanists as the *gossypium arborem*, or tree cotton, and is supposed to have originated in Persia. The fiber is remarkable for its length, strength, silkiness, and yellowish tinge. It grows luxuriantly in some parts of India and China, from the latter of which our importations of Nankin cotton were originally made. The Sea Island cotton of our Atlantic coast is a variety of this cotton, and greatly excels the *gossypium herbaceum*, or upland cotton, in length and strength of fiber, and differs from it in its color. This makes the strongest thread cotton in use, and as its yellowish tinge is much fainter than that grown in the East, chemical science has discovered a way to bleach it.

The color is generally considered to be due not to the climate but to the constituents of the soil, which must contain ferruginous oxides to give it the orange shade. Its length of fiber, and strength however, is due mainly to its species, as no upland or herbaceous variety ever equals it in this respect. The last generation was very partial to the Nankin cotton. At that time buckskin breeches, having a buff color, or cloths of a similar hue, were considered "the thing," and in summer the love of the color could be gratified by the substitution of the Nankin cotton as being lighter and almost as tenacious and durable. The changes of fashion, only, can be quoted as an adequate reason why the Nankin cotton should not now as then be popular as material for gentlemen's pantaloons and vests and ladies' dresses. Certainly no such cheap and agreeable material has as yet succeeded the Chinese product.

It seems as though nature was chary of her extremes in color. She produces but little material for our manufacture which is either pure white or unmitigated black. Our cotton, however nearly it approaches white, is still impure in shade, and the wool of the blackest sheep appears a dingy dark gray. To make them either the one or the other we must have resort to the sciences as practically applied. Even the white silk dresses of brides are colored. They are not of the natural tint. If so they would show an unsatisfactory tinge neither white nor positive yellow. When the silk, imported from southern Europe, or China, or Japan is received in this country, it has a dirty half yellow half orange shade which is not at all agreeable to the eye The blueish silvery luster which is seen in white silks and satins is produced wholly by the art of the dyer. It seems impossible to produce any vegetable material for textile manufacture which shall have a positive shade.

In animal products it is different. We can have perfectly black wool, also wool which is a perfect white. If it does not appear so when first sheared, thorough washing and cleaning by chemical means will make it rival the driven snow. No need of the art of the dyer here. Possibly, however, the time will come when by the advancement in the arts we may be able not only to give different colors to the vegetable products used in the manufacture of textile fabrics, but be able to bleach tinged material to a perfect snowy white.

TINNING RIVETS AND TACKS.

T. M. H., of Mass., desires to know how to coat tacks with tin. He says he has tried for a long time, but has not yet succeeded. The process is very simple, but some manufacturers make a great mystery of it and endeavor to keep it a secret. Rivets, tacks, and other small articles are tinned in the same manner. First, the tacks should be thoroughly cleaned. For this purpose dilute sulphuric acid is used, only strong enough to remove the grease and whatever scale there may be on the tacks. From the acid they are put into water and rinsed, then taken out and drained. While still damp, powdered salammoniac is sprinkled over them and they are ready to go into the bath. This is merely a cauldron of melted tin. Until the tacks are hot enough to "take" the tin they float on it, but soon as they sink they are ready to be removed. This is done with a perforated ladle or skimmer, and the operator throws the ladle-full of tacks violently against a a screen of sheet iron to loosen the excess of tin and prevent the tacks from being soldered together. From the screen they slide down inclined troughs of sheet iron long enough to insure the cooling of the tacks before they reach the bin.

These inclines must have considerable pitch so that the tacks cannot stop on the way and become glued to the trough.

This is the grand secret of tinning tacks. The acid cleans them and the salammoniac acts as a flux. All the tin that rattles off in the form of scales can be saved and remelted. The sale value of tacks tinned is increased about five cents a pound, and the cost is about two cents.

USES OF NUISANCES.

Few people can look with pleasure, or even complacency, on the reptile tribe, but they have their uses. The snail is a *bon bouche* to the French and others, and frogs or "water chickens" we know by trial to be delicious. The inhabitants of Central America delight in the flesh of the huge lizard, iguanodon, and even the musky flesh of the alligator is not obnoxious to them.

Years ago we knew of a lady, refined and cultivated, who eat with gusto the crawling bugs found under stones in moist places, called by the country people "sow-bugs," and declared they had a delightful acid taste. The French saying, *chacon a son gout,* is perfectly right. Every one to his taste. What is poison to one is nourishment to another; and we find in one of our exchanges a statement that the common angle worm when fed for a few weeks upon sugar is said to furnish a very delicate and delicious jelly, which is peculiarly acceptable to the stomachs of dyspeptics and consumptives.

We have no doubt of the truth of this statement. We have known this reptile used as a material for soup as well as for a poultice, applied outwardly and inwardly with apparently good results in certain cases of disease. Whether the cure was the consequence of the prescription, we are not physician enough to say, but that a cure did follow from this almost inhuman treatment, we know.

In fact, we have no better reason for rejecting the lowest of God's creatures as a means of our advantage, whether in health or sickness, than we have for denying our appetites the gratification of animal food altogether. At first sight the use of the reptile and insect tribe is unpleasant, but when we consider that from the earliest times whole tribes and nations have considered them legitimate articles of food or means of cure, we pretend to a nicety of taste not supported either by the practice of others of our race or by the Word of God if we reject them.

As we understand the purpose of the Creator, nothing was created in vain, and possibly while we have been trying to curb the elements, we have forgotten that the lowest orders of animal life may be made to minister to our wants and our necessities, if not to our love of change.

"Haloxylin"---New Blasting Powder.

The vast importance to the miner of a thoroughly good blasting powder, causes considerable interest to attach to all inventions relating to the manufacture of that article, especially when additional advantages are obtained without a corresponding increase in the cost of production. For some time past a new blasting compound---the novelty of which, however, consists rather in the mode of manipulating the materials than in the materials themselves—has been extensively used in the mines and quarries of the Austrian empire, under the name of haloxylin, which appears to have given great satisfaction, both from the quantity of work done and the manner of doing it. It is one of those powders which has the property of merely burning away when in the open air, and yet exerting a great rending force when properly confined in the blast hole; while it is not liable to ignite spontaneously, and cannot be exploded by percussion or friction. The smoke resulting from the explosion is less in volume than usual, and, in addition to this, it is free from the usual suffocating character of powder smoke; in fact, there is nothing in the residue injurious to health, or even disagreeable, so that operations can be carried on without intermission. A pound of haloxylin will occupy nearly twice the space of 1 lb. of gunpowder; and as it does fully two-thirds the amount of work, bulk for bulk, as any powder now in use, it follows that a material saving of cost is effected.

The invention of this powder is due to Messrs. Wilhelm and Ernst Fehleisen, of Styria; it consists of sawdust, charcoal, saltpeter, and usually, ferrocyanide of potassium, although the latter ingredient is sometimes dispensed with. The proportions in which they are combined are generally 9 parts by weight of sawdust, 3 to 5 parts of charcoal, 45 parts of saltpeter, and, 1 part of ferrocyanide of potassium. The sawdust, which if not from a non-resinous wood should have the resin extracted from it, is passed through a fine sieve, and then mixed with finely-powdered charcoal (from light woods) and powdered saltpeter. The mass is moistened with about a quart of water to the hundredweight, and then stamped or crushed. By this means the whole is rendered homogeneous. The mass is now moistened again with water under ordinary circumstances, and with a weak solution of ferrocyanide of potassium when a quick powder is required. The subsequent processes of caking, granulating, and drying are conducted in the same way as is usual in the manufacture of ordinary powder, and the grains can, if desired, be polished as usual, but this is found to be unnecessary.

Owing to the great cost of carrying explosive materials, the importation of haloxylin from Germany is, commercially, out of the question; it is, therefore, proposed to manufacture it in this country. There are at present three factories in Styria, Hungary, and Moravia respectively, yet they are scarcely able to keep pace with the continually increasing demand, and it is to this circumstances alone that is to be attributed the fact that until now, no efforts have been made to introduce it into England. The Hunyad board of the Kronstadt Mining and Smelting Company made careful comparative experiments in their Telek iron mines, and obtained with half the weight of haloxylin the same results as with the powder in ordinary use; but such a high duty as this probably resulted from some exceptional circumstances not having been taken into account; that 2 lbs. of haloxylin, however, will do as much as 3 lbs. of other blasting powder appears to have been well ascertained. The Austrian State Railway Company certify, as the result of the experiments made at their mines in the Banat, that the trials in the coal mines of Doman, took place in a cross course when very dense vapors prevailed; nevertheless, the place could be approached immediately after blasting, no smoke being left. As to the effect, 2 to 2¼ ozs. of haloxylin are equal to 3 to 3¼ ozs. of blasting powder. The result of the experiment with this substance showed that a firmer inclosing wall was required than with powder; the effect upon the rock was more cleaving than crushing, and on account of this property it promises considerable advantages over powder for the blasting of coal. In the ironstone mines of Morawieza the experiment was made in less firm rock, with large bores, and a charge of 25 to 30 lbs. of haloxylin produced an effect exceeding by one-third that of gunpowder. Such evidence as this is sufficient to prove that the non-explosive has, at least, some advantage over ordinary blasting powder; and when the quantity of blasting powder annually used in Great Britain is taken into consideration, it will be readily understood that, assuming even the smaller estimate 30 per cent of saving, the inducement for the miners of this country to adopt it will be ample to insure, under any circumstances, a fair remuneration to those undertaking the manufacture.—*London Mining Journal.*

English Artisans at the French Exhibition.

On Whit-Monday, as we learn from the London *Times,* the first batch of English artisans, about one hundred and fifty, went to see the French Exhibition. A little encampment of huts has been built close to the most frequented entrance of the Champ de Mars—namely the Porte Rapp—for the working classes, the huts are clean and comfortable. Some contain two beds and some four. More than one hundred of these beds have been engaged for the use of English artisans during the next five months; and during the present holidays a still larger number have been engaged. It is calculated that the trip to Paris will cost the British workmen about fifteen dollars, and for this sum he can stay there a week. The cost of transit to and fro absorbs half the money. There are kitchens all over Paris which provide the workingman with a cheap dinner, wonderfully good; and at the Omnibus Buffet, in the Champ de Mars, he can fare well at a very moderate charge. All the food in Paris is rigidly inspected. There are people there whose business it is to examine even the eggs that come into the market; so that the artisan can have no fear that he will have carrion or horseflesh or anything false offered to him. This omnibus restaurant is an immense place, with accommodations for fifteen hundred people to dine all at once. "The food is really good, and I doubt not says the *Times* correspondent, that the British workmen will enjoy the change and think it glorious. The only thing bad about the dinner is the cheap wine. The beer is very good, as they have not yet learned the art of adulterating it; but the British workman does not see the use of coming to Paris, if he is to drink beer."

Native India Muslins.

Whatever relates to textile fabrics, especially those of cotton, cannot fail to interest American manufacturers. In our growing familiarity with the marvellous amount and delicacy of the products of power looms and other machinery worked by steam, we are in danger of forgetting what is daily accomplished by means of hand looms and the workings of the supple and sensitive fingers. To this day India cotton goods, especially the Dacca muslins, or those from Eastern Bengal, have been imported into England, recommended by their superior softness, richness and durability. So, also, of the calicoes, chintzes, and ginghams, which form the staple manufactures of Coromandel. Though nearly driven out of the European market by cheap and successful imitations, they are still preferred in the East, where the curious believe themselves able to distinguish by the touch and even by the smell these genuine products of the Indian loom. The highest qualities of the Dacca muslins are splendid examples of the superiority of intelligent labor over the most elaborate machinery. The hand of the Hindoo, to use the language of a writer in *Once a Week,* "is educated to a delicacy of touch that is marvellous, and that delicacy is transmitted through succeeding generations until the native manipulator acquires a kind of instinctive aptness, which gives him all the unfailing regularity of a machine, directed by the intelligence of man." The native women spin with the finger a yarn which surpasses in fineness the machine-spun yarn paraded, in the great Exhibition of 1862, as a marvel of European skill. The classes of muslin called "woven air" and "evening dew" are, as their names would import, of surpassing fineness of fabric. It is related that a weaver was chastised and driven out of the city of Dacca for neglecting to prevent his cow from eating up a piece of this quality of muslin which he had spread out and left upon the grass, the article being so fine that the animal could not see it on the herbage. So delicate is the manufacture of the shirt staple of the Dacca cotton that it can only be spun into yarn at certain times of the day. Preference is given to the morning, before the dew has left the grass; or, if spinning be carried on after that time, it is over a pan of water, the evaporation from which yields moisture enough to prevent the fiber from becoming too brittle to handle. The Dacca muslin, with all its delicacy, will wash, while European muslin will not. A piece of "evening dew," one yard wide and four yards long, weighs only one ounce and eighty-six grains.

Figured muslin is a still more costly and delicate work of the Indian loom. No approach has been made by Europeans in producing the charming effect of weaving gold and silver threads into the different fabrics made in India. The embroidery in the woven garments, in which the absolutely pure gold is employed, never tarnishes, and it washes just as well as the other threads of the garment.

What will our American manufacturers, who may look to competing at some future day with the English in supplying the Indian market, say to the following statement made by the writer whom we have quoted above: "A native with a rude bamboo loom will, with his fingers and toes, finish a piece of muslin which cannot by all the application of our most delicate machinery be produced in Europe." A like superiority is evinced in the Hindoo's almost instinctive appreciation of appropriate form and color in design. He has learned to print fast colors. The native fabrics are remarkable for the sobriety and harmony of hue which they present. The English colors will not wash, and even Prussia is gaining the advance in supplying dyed goods to India.—*Philadelphia Ledger.*

Product of a Fleece of Wool.

The product in thread or cloth from a fleece of wool is something astonishing. At Norwich, many years since, 39,200 yards, or twenty-two and a quarter miles of thread, were spun from a single pound of wool; and 60 years ago a Miss Ives, at Spaulding, spun 68,000 yards or about 95½ miles of woolen thread from a pound of wool, off a Lincoln ewe. But this seems nothing to the multiplication a fleece now undergoes at Bradford. From the manufacturer who generally buys by "clip," I obtained this bit of information. A 20 pound Lincoln fleece, used as an admixture with cotton in the finest Alpaca fabrics, suffices for upward of twelve "pieces," each piece of 42 yards in length; it might probably be extended to 16 pieces, or a total length of 672 yards, three feet in breadth. At 3s a yard, the sum realized would £100; and I suppose (though I am not much of a dressmaker), that the crinolines of 80 or 90 ladies were covered with a single fleece of wool.—*J. A. Clark, Long Sutton, Eng.*

Rose Crop.

Mr. Blunt, the British Vice-Consul at Adrianopole, in his report to the Foreign Office this year, gives an account of the rose fields of the neighborhood of Adrianople, extending over 12,000 or 14,000 acres, and supplying by far the most important source of wealth in the district. The season for picking the roses is from the latter part of April to the early part of June; and at sunrise the plains look like a vast garden full of life and fragrance, with hundreds of Bulgarian boys and girls gathering the flowers into baskets and sacks, the air impregnated with the delicious scent, and the scene enlivened by songs, dancing, and music. It is estimated that the rose districts of Adrianople produced in the season of 1865 about 700,000 miscals of attar of roses (the miscal being 1½ drachms) the price averaging rather more than 3s. per miscal. If the weather is cool in spring, and there are copious falls of dew and occasional showers, the crops prosper, and an abundant yield of oil is secured. The season in 1866 was so favorable that eight okes of petals (less than 23 lbs.), and in some cases seven okes, yielded a miscal of oil. If the weather is very hot and dry, it takes double that quantity of petals. The culture of the rose does not entail much trouble or expense. Land is cheap and moderately taxed. In a favorable season a donum (40 paces square) well cultivated, will produce 1,000 okes of petals, or 100 miscals of oil valued at 1,500 piasters; the expenses would be about 540 piasters—management of the land 55; tithe, 150; picking 75; extraction, 260—leaving a net profit of 960 piasters, or about £8,11s. An average crop generally gives about 5 per donum clear of all expenses. The oil is extracted from the petals by the ordinary process of distillation. The attar is bought up for foreign markets, to which it passes through Constantinople and Smyrna, where it is generally dispatched to undergo the process of adulteration with sandal-wood and other oils. It is said that in London, the Adrianople attar finds a readier sale when it is adulterated than when it is genuine.

A Strange Telegraphic Freak.

A few weeks ago a couple of wires on the New York Central Railroad began to act very unreasonably. At ten o'clock in the morning they would "strike work," and resume at four in the afternoon. A careful examination of the line produced no result. The superintendent himself looked into the matter and saw nothing. It was a complete puzzle. An old Albany operator, however, was more successful. About sixty miles west of that city he found a point where the wires passed over the roof of a building, almost touching it. As the sun rose, the wires fell, and at twelve o'clock they lay snugly together on the tin roof. As the sun fell, they cooled and rose, and by four o'clock they were in their proper positions. Of course the trouble was rectified.

A PATENT has recently been taken in England for introducing into the liquid metal in the puddling or other furnace used for converting cast iron or steel, the vapor of nitric acid or chloric acid rich in oxygen, or their salts, and also the vapor of hydro-acids or other materials rich in hydrogen, or the salts of hydro-acids, or mixtures of the said acid vapor, either alone or combined with a blast of air; or liquid hydro-carbon in a state of vapor may be introduced into the liquid metal. By the introduction of the oxydizing gaseous liquid or solid compound the decarbonization of the iron and the oxidation of siliceous matters in the iron are promoted. When hydro-acids or materials rich in hydrogen, or the salts of hydro-acids, are passed through the melted metal, they are decomposed, and at the moment of decomposition, or when the elements are in a nascent state, they act upon the metal and improve its quality. The quantity of acid or salt employed will depend upon the composition of the iron acted upon.